Reasonably Available Control Technology Analysis

January 19, 2017
Air Pollution Control Division
Colorado Department of Public
Health & Environment



RACT - Basics

- Moderate Ozone NAAs are required to implement RACT
- RACT level controls required for:
 - All VOC sources subject to a CTG
 - All major VOC and NOx sources
- RACT "lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility"
- RACT analysis must reflect the "latest information"

RACT Analysis Request

- Regulation 7 Section XIX.B Major Sources
 - o 16 Sources
 - o Must submit a RACT analysis by December 31, 2017

	Source	Source ID	Unit Type	Emissions Points
1	Anheuser-Busch	069-0060	Brewing	all points ≥ 2 tpy VOC and ≥ 5 tpy NOx
2	Buckley Air Force	005-0028	Engines/test cell	102, 103, 104, 105, 101
3	Carestream Health	123-6250	Boiler	004
4	Colorado State University	069-0011	Boilers	003, 005, 007, 013
5	IBM	013-0006	Engines & boilers	088, 090, 001, 011, 095
6	MillerCoors Golden Brewery	059-0006	Brewing	all points ≥ 2 tpy VOC and ≥ 5 tpy NOx
7	MMI/EtOH	059-0828	Brewing waste	all points ≥ 2 tpy VOC and ≥ 5 tpy NOx
8	Nutri-Turf	123-0497	Brewing waste	all points ≥ 2 tpy VOC and ≥ 5 tpy NOx
9	Owens-Brockway Glass	123-4406	Glass melt furnaces	all points ≥ 5 tpy NOx (001-023, 025)
10	Public Service Company - Cherokee	001-0001	Turbines	028, 029
11	Public Service Company - Fort Saint Vrain	123-0023	Turbines & Boilers	010, 011, 001
12	Rocky Mountain Bottle	059-0008	Glass melt furnaces	001
13	Suncor	001-0003	Boilers	309, 019, 021, 023
14	Tri-State G & T - Frank Knutson	001-1349	Turbines	001, 003
15	TXI	059-0409	Shale Kiln	001
14	University of Colorado - Power House & East	013-0553	Boilers	001, 002, 012, 013
16	University of Colorado - Williams Village	013-0019	Boliers	001, 002

Sooner if Possible

RACT Analysis Request

Other Major Sources

- o 9 Sources
- o Must submit a RACT analysis by December 31, 2017

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Sooner if

	Source	Source ID	Unit Type	Emissions Points	
1	Colorado Energy Nations Company	059-0820	Boilers	001, 002	
2	Colorado Interstate Gas - Latigo Compressor Station	005-0055	Engines	001, 011	
3	Colorado Interstate Gas - Watkins Compressor Station	001-0036	Engines	001, 002, 005	
4	Public Service Company - Denver Steam	031-0041	Boilers	001, 002	
5	Public Service Company - Fort Lupton	123-0014	Turbines	001, 002	
6	Public Service Company - Valmont	031-0001	Turbine	002	
7	Public Service Company - Zuni	031-0007	Boilers	001, 002, 003	
8	Kerr-McGee Gathering - Platte Valley Gas Plant	123-0057	Turbine & Engines	052, 038 - 041, 044, 047-049	
9	WGR Wattenberg Gas Processing Plant	001-0025	Boiler, Turbine & Engines	012, 021, 004, 018	

Considerations

- Differences in RACT SIP vs. permit
 - o categorical vs. source specific
 - o existing vs. new/modified
- Reasonably available, technologically and economically feasible
- RACT may range from nothing more to work practices to add-on controls
- 2008 vs. 2015 O3 standard

RACT Analysis - General

- Emission Point Specific
- Pollutant Specific
 - o NOx, VOC
- RACT analysis needs to consider all typical control technologies for the emission unit or point
 - Control Technology can mean a control device or work practice
 - Top-down ranking by most effective at emission reductions (tons/year)
 - o Annualized (based on equipment life) costs per ton of pollutant reduced
 - o Can use EPA Air Pollution Control Cost Manual
 - <u>https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution#cost</u>
 - Other Resources
 - RACT/BACT/LAER Clearinghouse
 - Ozone Transport Region



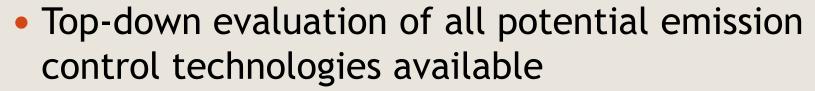
RACT Analysis - Content

Description of Emissions Unit or Point

- o Manufacturer and unit power rating on primary fuel
- Date unit placed into service
- Type of control technology (or could include work practice) already in use for applicable pollutants
- Date of installation or implementation of current control technology
- o Estimate of current control technology effectiveness
 - Capture
 - Control Efficiency

(continued)

RACT Analysis - Content

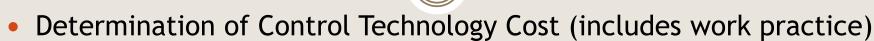


- List each available (prevalent) control technology for each applicable pollutant
- Describe the control technology
- Discussion of technological feasibility of each control technology
- Evaluate control effectiveness of each technically feasible control technology
- Determine actual emissions reduction for each technically feasible control technology



(continued)

RACT Analysis - Content



- o Capital cost of each control technology evaluated
 - Cost of device or equipment and materials
 - Vendor bid documentation is preferred
- One-time costs
 - Delivery, engineering, labor, equipment and incidental costs
 - Installation and startup costs
- Annual operation and maintenance costs
 - Maintenance, equipment replacement (e.g. catalyst), monitoring
- Indirect and Other costs
 - Overhead, administration, taxes, insurance, contingency
- Description and estimate of potential cost savings
- Calculate total annualized cost of control technology
 - Determine \$/ton cost for each control or work practice
- Provide RACT recommendation for the unit based on technological and economic feasibility
 - Include proposed monitoring methods or options

(continued)

RACT Analysis - Content



- Standard assumption for interest rate
 - 2014 O&G rulemaking used 5-6% interest rate
- Standard assumption for useful life of equipment
 - Depends on equipment or work practice
 - 2014 O&G rulemaking used 5-15 years depending on equipment or work practice
- Other cost assumptions
 - Can use EPA Cost Manual
- Potential example templates for RACT analysis
 - o https://www.colorado.gov/pacific/cdphe/regional-haze-plan
- Division working on very basic guidelines/expectations for RACT analysis



Example Engine RACT Cost Calculations

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Source Information		Annual		
Manufacturer:	Caterpillar	Maintenance & Monitoring (\$/yr):	\$	4,000
Model:	G3412CLE	Annualized Costs:	\$	4,000
Classification:	SI-4S-LB	Replacement (Annualized)		
Rating (horsepower):	586	Catalyst (every 5-years):	\$	2,126
Assumptions		Install/Construction (10% of Original):	\$	2,732
Useful Life-Control Equipment (years):	10	Annualized Replacement Costs:	\$	1,240
Catalyst Replacement (years):	5	Other		
Annual Interest Rate (%)	5%	Taxes (assume 8% of Capital):	\$	239
Emissions		Contingency (assume 10% of Capital & Construction):	\$	581
VOC Emissions:	2.285	Annualized Replacement Costs:	\$	819
Oxidation Catalyst Control Efficiency:	50%	Indirect		
Annual VOC Emissions Reduced (post control in tons/year):	1.142	Overhead (60% of all labor plus maintenance materials-EPA Cost Manual):	\$	8,672
Costs		Adminstration (2% of total capital investment-EPA Cost Manual):	\$	366
Capital (Direct)	400	Property Taxes (1% of total capital investment-EPA Cost Manual):	\$	183
Oxidation Catalyst:	\$ 8,330	Insurance (1% of total capital investment-EPA Cost Manual):	\$	183
Material:	\$ 2,848	Annualized Indirect Costs:	\$	1,532
Structural Support:	\$ 7,125	Capital Cost Recovery		
Annualized Capital Costs:	\$ 2,981	NPV (net present value):	\$9	9,861.94
Construction		CRF (capital recovery factor):	0.	.2309748
Labor:	\$ 10,454	Capital Recovery = [NPV * CRF]; see EPA Cost Manual-EQ. 2.8:	\$2	2,277.86
Equipment:	\$ 3,833	Annualized Capital Recovery Costs:	\$	2,278
Incidental & Miscellaneous (assume 10% Engr/Comm/Labor/Equip):	\$ 1,429	Total of Annualized Costs:	\$:	15,676
Delivery (5% of Capital & Construction Cost):	\$ 1,630	Cost Effectiveness		
Annualized Construction Costs:	\$ 2,825	VOC control cost(Total Annualized Costs/Annual VOC Emissions Reduced):	Ċ.	13,723



Questions

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